

DEFINING FREIGHT RATES AS A CONTRIBUTION TO THE SUCCESSFUL OPERATION OF CONTAINER SHIPPING COMPANIES

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The globalization of the world market and the flexibility of containerization to adjust to the constant changes in supply and demand of the international goods market, has led to a continuous increase in the portion of the container transport within the international maritime cargo transport. By the increase of the container transport level, the impact and importance of container freight rates have been growing, the variability of which directly reflects on the world economy. The aim of this paper is to analyze the efficiency of actual methods in establishing the container freight rates according to the problems which appear in the container shipping operation and refer to large differences in the weights of the actual transported cargo and the declared cargo in containers. The consequence of is lower freight rates and higher costs of the vessels exploitation, concerning the increase of the bunker oil consumption. The conducted research is based on actual data that have been collected and analyzed from particular container vessel liner services within period of 90 days and casting off from 16 container ports. The proposed measures could increase the level of usability of the transporting ships capacities and enable a more accurate and correct account of sea freight rates. The results of the research have shown that by increasing the control of accuracy

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of the cargo weight in containers and by improving the model of accounting, the freight rates can increase the incomes of shipping companies maintaining the same level of container traffic, which can have a direct influence on the efficiency of their successful operation.

1. INTRODUCTION

Container shipping companies provide a continuous service of containers transportation among container ports. They commit to accept the cargo of all shippers and to carry out their transportation regardless of the occupancy of the vessels capacity according to the confirmed terms of the published maritime timetables (Stopford, 2009).

When the maritime line service networks are set up, they are not subject to continuous changes in routes and voyage timetables. The shipowners occupy available capacities exclusively by changing the price of container freight rates. The constant presence of variable market needs and variable operational costs had a direct impact on the fluctuation of freight rates supply. The continuous conditions monitoring on the maritime market and the duly adjusting of freight rates could result in the optimization in the vessels size which hold single lines and adequate containers configuration which not only will assure the best profit but will also achieve the largest savings in costs (Chen Chao, 2009).

Gouvernal & Slack (2012) point out that container freight rates do not represent only the costs that shippers have to pay for the transport of their containers, but they are an important factor in defining the structure of the spatial connection of the market. Geographical distances are not the only basis for the account of container freight rates, but they are in complete opposition with the economic separation of the market. On the world's largest markets, the strongest competition is present. The ship owners introduce very high freight rates in the period of the economic growth but in the periods of crisis the freight rates are decreased to the lowest possible level.

Luo et al. (2009) use a dynamic economic model in analyzing the fluctuation of container freight rates which incurred while interacting with the level of demand for container transport service and the total capacity of the world container fleet. The result of the model provided useful information which can be used in stabilising the container freight rates market and decreasing the negative consequences of the financial and economic crisis which appear in maritime industry.

In protecting and securing their business interests, container shipping companies impose a vast number of surcharges on the basic freight rate and make the structure of container freight rates a very complex one (Slack & Gouvernal, 2011). The freight rate surcharges can be even higher than the basic freight rate, so their role is very important for each shipper. Observing the movement of basic freight rates on the world container market, one cannot give the complete information about the total costs of each line service. The height of all surcharges has to be taken into consideration.

Container shipping represents one of the fastest growing segments of maritime industry (Notteboom & Rodrigue, 2009). The total world container sea transport increased from 28,7 million TEU in 1990 to 165,6 million TEU in 2011 with an average annual growth of 8.72 % (Fakhr-Eldin & Notteboom, 2012). Within the total quantity of cargo transported in maritime traffic, container traffic participated with 17% in 2010. The container shipping companies are faced with the problem of not declaring the real weight of cargo in containers. The World Shipping Council and the International Chamber of Shipping (2010) warned about that problem and they estimated, according to the data obtained from container shipping companies that this deviation was up to 10 % off the total cargo transported.

The vessel capacities are limited by area and weight, so the container shipping companies must dispose with the correct information about the cargo accepted for transport in ports included in the liner service. The unification of container units in advance precisely defines the occupancy of the cargo ship area regarding the volume, but if the cargo weights in containers are not precisely declared, the carrying capacity of container vessels will not be used as planned. The shipowners will not get the proportional part of freight rate that refers to the undeclared cargo weight in container and the total costs of the voyage will be higher due to the higher spending of bunker oil.

The subject of research of this paper is the level of impact of the cargo weight on the amount of freight rates and how to improve the account model of container freight rates in order to have a more efficient and profitable operation of maritime shipping companies.

In order to achieve this goal, we will analyze the container shipping market and the basic structures of the container freight rates. Using the data provided by monitoring the traffic of container liner vessels, the level of difference between the declared and the transported amount of cargo in containers will be analysed. Based on the results of the analyses, in correlation with the container

freight rates, the authors have proposed measures and activities that will improve the financial model of container freight rates.

2. THE CONTAINER SHIPPING MARKET

The container shipping market has developed from the liner shipping market due to the need for the implementation of the intermodal transport and the concept of transshipment of final products, i.e. general cargo by the „door to door“ system with standardized transshipment units. Containerisation has increased the speeds in the manipulation and decreased the exposure of cargo to damages and has promoted multimodal transport as well.

Container shipping has developed at all maritime corridors where stability in demand for container cargo transshipment exists and which enable the regularity in liner navigation. The basic characteristics of container shipping are (Roškar & Švetak, 2007):

- container vessels sail according to previously defined lines and schedule,
- container shipping companies in ports offer only a part of the ship capacity because of the occupancy with containers intended for other ports in navigation,
- ship depot area is usually not fully used,
- the oscillation between supply and demand of container ship area does not directly influence the height of freight rates and
- container freight rates are directly dependent on the total costs of liner navigation.

Container shipping is capital a very high intensive industry in which the shipowners have important investment decisions based on uncertain needs of the market. The presence of non-elastic demand, market imbalances between trade centres and constant pressure by shippers to decrease the price of sea freight rates, make pressure to maritime shipping companies to ensure the stability in handling liner services and constant profitability for their companies (Fakhr-Eldin & Notteboom, 2012).

In the year 2010, the container shipping companies transported 17% of the world cargo in maritime traffic i.e. 140 million TEU or 1.4 billion tons of cargo (UNCTAD, 2011). At the beginning of the year 2011, they had a fleet of 4,868 container ships with a total capacity of 14.1 million TEU (UNCTAD, 2011).

3. THE PRICE OF FREIGHT RATES IN CONTAINER SHIPPING

Freight rate in maritime traffic is considered to be the price that the user of maritime transport has to pay to maritime shipping companies for the transport service (Toković, 2002). That is the market price which is defined according to the relations between the supply and the demand of ship transport on the maritime market. The amount of freight rate is affected by the market of the ship area derived from the goods market, the movement of goods, service prices and protectionist action.

The freight rate includes all costs which maritime shipping companies have in performing maritime transport activities and a particular amount of profit. The total costs of the maritime shipping companies business consist of (Stopford, 2009):

- operative costs (costs of ship crew, administration, insurance, maintenance),
- costs of periodic maintenance (costs of repair),
- costs of navigation (bunker oil, port and channel charges),
- capital costs (costs of the financial model of the ship acquisition) and
- costs of cargo manipulation (costs of loading, unloading and stowage of cargo).

Freight rates in container shipping are defined by tariffs for particular cargo groups or for each type of cargo separately. They are formed by the principles of public goods, equality usage, duration, uniformity of service and clarity. Regarding the fact that freight rates are published, it facilitates the users to calculate the costs of transport in advance and predict the cost effectiveness of a particular business. For shipowners, the public freight rates decrease or delete the competition between them, enable the incomes higher than the limiting costs and insure sustainable business development.

4. CONTAINER FREIGHT RATES

In liner shipping the transport of containers is performed between container terminals. The container shipping companies connect them with the vessels of different sizes. In general, they can be divided into „mother“ ships of higher capacity that sail between hub-terminals (large central transshipment terminals) in a direct line and feeder ships with smaller capacity that connect hub-terminals with many spoke-terminals (smaller target terminals). This kind of organization has created the network which covers all parts of the world

container market. It also stimulates the traffic between main hub-terminals which, in the last 20 years have been continuously growing (Karlić Mujo, 2009).

In container traffic, the freight rates are defined as a price of service per one container unit. They are not completely dependent on the type of cargo transported, but on the importance of the transport user for each maritime shipping company and on the total quantity of cargo which is intended to be transported from a particular destination. That is the reason why container shipping companies have created freight rates maritime tables according to which they sell their ship capacities in accordance with the world container port network and the container type or size (20 feet, 40 feet, frigo container, etc.).

When forming freight rates, agents collect data of the types, weights and capacities of cargo, as well as of the direction and speed of transport they want to be achieved. The container freight rates are defined and published in advance and they are valid for a particular period of time. They are defined in order to cover the total costs of ship-owners, concerning liner services with a particular level of profit. Agents, who sell ship capacities, use the basic freight rates network according to the list of all ports on this shipping line. The basic criterion for defining lower freight rates is the value of business done with particular shippers (large economic subjects, exporters, importers, international forwarders, etc.).

For many years, the structure of container freight rates has changed due to the increase of business complexity of container shipping companies. The impossibility of a daily freight rates adjustment with the constant changes of numerous costs, has conditioned the implementation of numerous freight rates surcharges. The basic freight rates surcharges are (Slack & Gouvernal, 2011):

- THC (terminal handling costs) - includes the costs of container manipulation on container terminals (fixed for a period in which the container shipping companies have signed contracts with container terminal operators),
- BAF (bunker adjustment factor) - covers the costs of bunker oil when the prices of bunker oil go over the particular level (ship owners protection from constant changes of bunker oil prices on the world market) and
- CAF (currency adjustment factor) - covers losses caused by exchange rate difference (ship owners protection from constant fluctuation in the value of currency).

Among other important freight rates surcharges are the following ones:

- port congestion surcharge,
- war risk surcharge,
- IMO surcharge,
- heavy weight surcharge,
- peak season surcharge,
- winter surcharge,
- the Panama Canal surcharge,
- the Suez Canal surcharge, and many others.

The basic elements of container freight rates are shown in Figure 1.

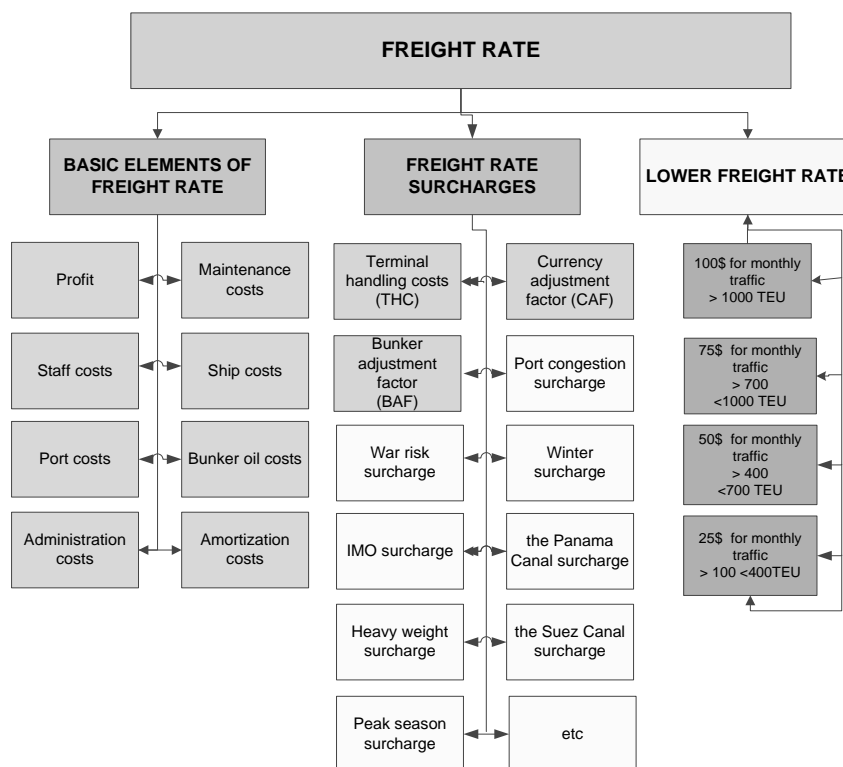


Figure 1. Basic elements of container freight rates

Source: Authors.

As shown in Figure 1, the freight rates (FR) have three main elements:

- basic elements of freight rate (BEFR),
- freight rate surcharges (FRS) and
- lower freight rate (LFR).

$$FR = \sum_{i=1}^n \frac{BEFR + FRS - LFR}{TEU}$$

Lower freight rates occurred in certain cases when the shippers have accomplished a large total monthly traffic in TEU and, according to the ship-owner scale, have got a discount off the basic freight rates.

5. METHODOLOGY AND RESEARCH

In order to estimate the impact of freight rate surcharges on the total amount of freight rates, the authors have analysed the main freight rate surcharge BUC (bunker contribution) in relation to the basic freight rate in the one year period.

Table 1. Values of basic container freight rates according to the loading and unloading ports' current freight rate surcharges

Loading Port	Unloading port	20" (USD)	40" (USD)	40"HC (USD)	VALID UNTIL
Chiwan	RIJEKA	130	260	310	09/ 01/ 2013
Fuzhou	RIJEKA	180	310	360	09/ 01/ 2013
Hakata	RIJEKA	230	460	510	09/ 01/ 2013
Ningbo	RIJEKA	130	260	310	09/ 01/ 2013
Phnom pen	RIJEKA	430	860	910	09/ 01/ 2013
Shanghai	RIJEKA	130	260	310	09/ 01/ 2013
Shantou	RIJEKA	180	310	360	09/ 01/ 2013
Xiamen	RIJEKA	130	260	310	09/ 01/ 2013
Xingang	RIJEKA	130	260	310	09/ 01/ 2013
Yokohama	RIJEKA	230	460	510	09/ 01/ 2013

Freight rate surcharges: BUC 920 USD/TEU + piracy risk fee 55 USD/TEU + the Suez Canal fee 20 USD/TEU + carrier security fee 11 USD / container + costs in the port of destination.

Source: General offer of freight rates by the Mediterranean Shipping Company, 2012.

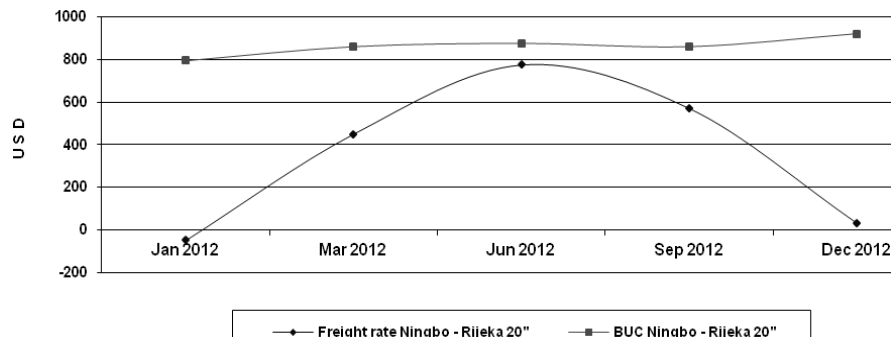


Figure 2 - Annual diagram of freight rate and freight rate surcharge BUC (bunker contribution) movement in relation to Ningbo (China) - Rijeka (Croatia) for a 20 feet container

Source: General offer of freight rates by the Mediterranean Shipping Company, 2012.

Regarding the above-mentioned data, it can be concluded that container freight rates represent the basic freight rate and all surcharges added, where, sometimes, freight rate surcharges are higher than the sum of the basic freight rate on a particular line. That points to the fact that their role and importance are very high, because, on the one hand, they enable container shipping companies to have an economic stability in doing business, and, on the other hand, they represent additional costs to the container transshipment users.

According to the data shown in Figure 2, it follows that the BUC surcharge (surcharge on the basic freight rate for bunker oil consumption) is much higher than the basic freight rate in a particular period of the year. Large oscillations in the basic freight rate price are connected with the supply and demand of ships space and with the quantity of cargo on a particular market, while BUC reflects only the bunker oil costs which the ship-owners have on a particular line.

Given that the bunker oil consumption increases with the increase of the total cargo weights on board vessels implicates the fact that container ship-owners have direct financial losses when the freight rates are on a low or negative level and cargo weights within containers are shown in smaller amounts.

The forming of freight rates in maritime shipping is closely related to the level of the quantitative and temporal usage of the available ship capacities. The temporal usage is defined by the time needed for performing the maritime

transport, while the quantitative usage refers to the ships size and their ability to transport a particular quantity of cargo measured from the aspect of weight and volume.

In container shipping, the temporal and quantitative usage of the ship capacities is mostly known and predictable, so container shipping companies organize the ship lines with those ship capacities which will transport the planned container load at the lowest total costs per cargo unit. That kind of organization has generated the most efficient transshipment results during the maritime transport process and enabled positive economic indicators (Ivče et al., 2009).

Transshipments are conducted according to liner routes and sailing lists defined in advance. The volumes of cargo are standardized according to the container types and weights specified in the manifest of cargo. However, the World Shipping Council and the International Chamber of Shipping (2010) warned that the cargo weight in containers is not correctly presented.

Due to the maximal usage of the container volume and due to the weight limits implemented by some shippers through freight rate surcharges for particular lines in some periods of the year (characteristic for Chinese markets), particular shippers have purposely given wrong data of the cargo weight in containers.

6. RESULTS OF THE RESEARCH

The authors have analyzed the level of influence of the wrongly notified cargo weight in containers with the data collected from particular liner services of the RHL FIDELITAS container vessel, built in 2010, of the length of 294 m, capacity 54.182 t, draft 12 m and of a total capacity of 5,090 TEU in the 90 days period and casting off from 16 container ports.

Table 2 shows that after casting off from a particular container port, there is always a particular undefined difference in weight on board vessels. Given that all the weights on board a vessel are mostly known and the tare of empty containers are correctly marked, the only possible reason for these differences is the undeclared correct cargo weight in containers. For the observed voyage, the undeclared correct cargo average is 1,460 tons per one transshipment port (total difference in weight / 16 observed ports).

Table 2. Recapitulation of the total weights on board the M/V RHL FIDELITAS after casting off from particular ports during the observed liner service

Date and cast off port	(1)	(2)	(3)	(4)	(5)	(6)
18/ 05/ 2011 Odessa	60353	22198	38155	23452	13053	1650
04/ 06/ 2011 Illichivsk	57496	22198	35298	19992	14457	849
05/ 06/ 2011 Constanta	54144	22198	31946	18469	12337	1140
11/ 06/ 2011 Istanbul	80463	22198	58265	42808	13867	1590
26/ 06/ 2011 Port Kelang	71195	22198	48997	33520	14828	649
06/ 07/ 2011 Xingang	70847	22198	48650	34014	12786	1850
11/ 07/ 2011 Qingdao	61457	22198	39259	25716	12243	1300
14/ 07/ 2011 Shanghai	63333	22198	41136	26820	12316	2000
15/ 07/ 2011 Ningbo	74091	22198	51893	38598	11476	1819
17/ 07/ 2011 Xiamen	77150	22198	54953	40891	12442	1620
19/ 07/ 2011 Chiwan	81025	22198	58827	43586	13841	1400
24/ 07/ 2011 Port Kelang	83815	22198	61617	43773	16044	1800
07/ 08/ 2011 Port Said	73156	22198	50959	35923	13192	1844
11/ 08/ 2011 Istanbul	66494	22198	44297	29715	12622	1960
13/ 08/ 2011 Illichivsk	63623	22198	41425	29721	10704	1000
15/0 8/ 2011 Odessa	55013	22198	32815	21003	10923	889

(1) Displacement (tons)

(2) Empty vessel (tons)

(3) Total weights on board a vessel (tons)

(4) Cargo (tons)

(5) Ballast, bunker oil, water, equipment (tons)

(6) Difference in weights (tons)

Source: Made by authors according to the ships reports and manifest of cargo on the observed voyage of the M/V RHL FIDELITAS.

The average deviation between the real cargo weight and the declared one which is presented in the vessel manifest of cargo in fully loaded containers is 5.11% (Table 3). That the deviation is in correlation with the fully loaded

containers implicates that, while casting off from a particular port, there are, on board the vessel, 106 TEU fully loaded containers more than declared in the manifest of cargo.

Table 3. Analysis of the research results of the total number of containers on board the M/V RHL FIDELITAS after casting off from particular ports during the observed liner service with a deviation between the declared and real cargo weights in containers

Date and cast off port	Diff. in cargo weights (tons)	No. of cont. (pcs.)	TEU full	TEU empty	Weight of full cont. (tons)	Weight of empty cont. (tons)	Deviation in undeclared weight in relation to the full container weight in %	Deviation in average number of full containers regarding the deviation in weight (TEU)
18/05/2011 Odessa	1650	1302	1680	602	22169	1283	7.44	125
04/06/2011 Illichivsk	849	1096	1314	602	18693	1298	4.54	60
05/06/2011 Constant	1140	1050	1119	640	17069	1400	6.68	75
11/06/2011 Istanbul	1590	2616	2148	2026	38743	4065	4.10	88
26/06/2011 Port Kelang	649	2250	1729	1976	29553	3967	2.20	38
06/07/2011 Xingang	1850	2051	1793	1479	31052	2962	5.96	107
11/07/2011 Qingdao	1300	1443	1557	774	24159	1557	5.38	84

Date and cast off port	Diff. in cargo weights (tons)	No. of cont. (pcs.)	TEU full	TEU empty	Weight of full cont. (tons)	Weight of empty cont. (tons)	Deviation in undeclared weight in relation to the full container weight in %	Deviation in average number of full containers regarding the deviation in weight (TEU)
14/07/2011 Shanghai	2000	1540	1771	621	25565	1255	7.82	139
15/07/2011 Ningbo	1819	2159	3009	487	37619	978	4.84	145
17/07/2011 Xiamen	1620	2062	3332	0	40891	0	3.96	132
19/07/2011 Chiwan	1400	2286	3739	0	43586	0	3.21	120
24/07/2011 Port	1800	2309	3811	0	43773	0	4.11	157
07/08/2011 Port Said	1844	1862	3096	0	35923	0	5.13	159
11/08/2011 Istanbul	1960	1768	1992	899	27963	1752	7.01	140
13/08/2011 Illichivsk	1000	2169	1799	1924	25815	3906	3.87	70
15/08/2011	889	1921	941	2402	16094	4909	5.52	52

Source: Authors, from ship reports and manifest of cargo during the observed voyage of the M/V RHL FIDELITAS.

Differences in weight have a negative impact on container shipping companies business and are seen through direct and indirect financial losses

caused by the following problems (World Shipping Council & International Chamber of Shipping, 2010):

- lower useful bearing capacity of container vessels,
- impossibility of charging freight rates for the actual transported cargo in containers,
- creating incorrect plans for container stowage,
- overcapacity of some lines of container stowage,
- increase of risks in container and vessel damage,
- increase of risks in losing containers loaded on deck,
- incorrect calculation of the ship stability,
- incorrect clause of cargo and shippers responsibility,
- higher level of risk in the safety of the vessel crew work,
- increase in bunker oil consumption, etc.

7. MITIGATION OF THE NEGATIVE IMPACT OF THE CARGO WEIGHT IN CONTAINERS ON THE AMOUNT OF THE SEA FREIGHT RATE

The frequency and regularity of the transport service on a particular container line is defined by the capacity of the container vessel and the occupancy of the stock capacities. Regarding previous conclusions, it is evident that the cargo weight in containers has a very important influence on the business of maritime shipping companies (Figure 3).

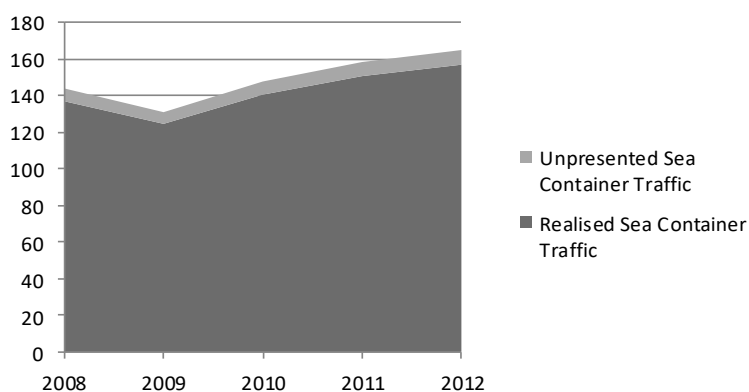


Figure 3. Correlation of the total realised and unrepresented sea container traffic

Source: UNCTAD, Review of Maritime Transport 2013.

Note: The unrepresented sea container traffic is defined by the results from Table 3 of 5.11%. The usage of stock capacities with container weights showed, in a lower amount, a negative influence on the economic indicators of the container shipping companies business. Therefore, measures for abating the consequences of negative impacts have to be implemented.

One of the main measures should be aimed at insuring the necessary equipment at delivery terminals. That would enable weighing full containers before loading them on board container vessels. Accordingly, container shipping companies would ensure correct data of cargo weights in advance and create prerequisites for the calculation of freight rates on the real cargo quantities transported.

If particular containers do not have a weight report of the delivery terminal, which would be included in the reports previously sent to vessels in arrival by container terminals, container shipping companies will reject to accept that container. Accordingly, all negative consequences caused by the incorrectly declared cargo weight in container will be completely eliminated and the level of exposure of container shipping companies to unnecessary risks will be decreased (Figure 4).

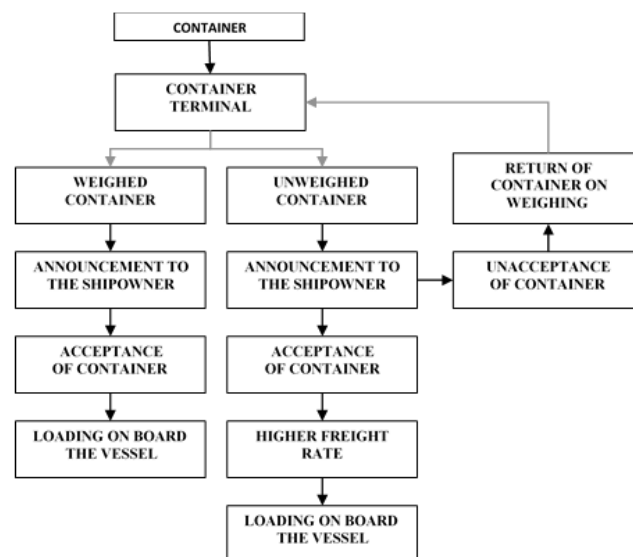


Figure 4. Schematic model of the container weight control before the acceptance of loading the container on board the vessel

Source: Authors.

In cases when container terminals are not able to ensure the equipment needed for the weighing of container due to financial or some other limits, the maritime shipping companies could implement an additional surcharge on a particular percentage. In such a way, losses caused on account of freight rate for lower cargo quantities in containers would abate. The percentage of freight rate surcharge would be accounted by the internationally published table in which all container shipping companies would put their data on the level of differences between the declared and the actual transported cargo weights in containers.

8. CONCLUSION

Container shipping companies operate on a turbulent international market where their successful business does not depend only on themselves, but on numerous other external factors as well. Apart from the conditions on the shipping supply and demand market, continuous changeable ship costs and business conditions may be also abstracted as well as the influence of the business relation level which they have with container shippers. That relationship should be based on the accuracy in exchanging the data on the types and quantities of cargo in transport, but, according to the warnings from the World Shipping Council and the International Chamber of Shipping (2010), shippers often do not present the correct cargo weights in containers. These differences are estimated at 10% out of the total transported cargo. In the analysed voyage, the difference is 5.11%, which means the loss of 7,154 million TEU and 71,54 million tons out of the total container traffic of 140 million TEU and 1,4 billion tons in 2010.

The undeclared cargo weights have also an impact on the increasing usage of the vessels capacities and on the decreasing freight rates values of the cargo transported, thus cutting down directly the financial results of the shipping business. The implementation of control measures in testing the validity of the declared cargo weight in containers would minimize today's deceptions. These certainly have a positive influence on the success of container shipping companies business, which would achieve better financial results. Furthermore, this would decrease the total business costs per unit of the transported cargo and ensure a safer sustainable growth and development of shipping companies.

Measures used in abating the negative consequences caused by incorrectly declared cargo weights in containers should be primarily focused on ensuring the necessary equipment which would enable precise weighing of all containers before shipping. However, if this is not possible, container shipping companies will be left with the possibility of implementing a new freight rate surcharge

which would substitute losses caused by differences in the calculation of freight rates between the declared and actual transported cargo weight. The implementation of the proposed models for solving the observed problems would improve the system of container freight rates account and would certainly perform a much safer work in container manipulations.

Further researches are focused on analysing the world container market and detecting particular ports where a great difference between the declared and real cargo weights in containers is present. Moreover, in the structure of the goods transported in containers, some types of cargo which are subject to manipulations will be abstracted. All data of every single world container shipping company will be collected and analysed. This will create prerequisites for determining the level of losses caused by incorrect declaring of the cargo weights in containers.

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DOPRINOS FORMIRANJU KONTEJNERSKIH VOZARINA U FUNKCIJI USPJEŠNIJEG POSLOVANJA KONTEJNERSKIH BRODARA

Sažetak

Globalizacija svjetskog tržišta i elastičnost kontejnerizacije da se prilagodi stalnim promjenama ponude i potražnje na međunarodnom tržištu roba, dovela je do konstantnog povećavanja udjela kontejnerskog prometa u ukupnom međunarodnom pomorskom teretnom prometu. S porastom razine kontejnerskog prometa rastao je utjecaj i važnost kontejnerskih vozarina, čija se promjenljivost direktno odražava na svjetsko gospodarstvo i ekonomiju. Cilj ovog znanstvenog rada je analizirati uspješnost dosadašnjih metoda formiranja kontejnerskih vozarina s obzirom na uočene probleme koji se pojavljuju u poslovanju kontejnerskih brodara, a odnose se na velike razlike u težinama stvarno prevezenog i deklariranog tereta u kontejnerima, što ima za posljedicu obračun niže vozarine i veće troškove eksploatacije brodova prvenstveno radi povećane potrošnje pogonskog goriva. Provedeno istraživanje temelji se na stvarnim podacima koja su prikupljena i analizirana s određenog linijskog putovanja kontejnerskog broda u periodu od 90 dana i isplovljenju iz 16 kontejnerskih luka. Predložene mjere mogle bi povećati razinu iskoristivosti prijevoznih kapaciteta brodova, te omogućiti precizniji i točniji obračun pomorskih vozarina. Osim toga rezultati istraživanja ukazuju da se uz povećanje kontrole ispravnosti težine tereta u kontejnerima i unapređenju modela obračuna vozarina mogu povećati financijski prihodi pomorskih brodara uz zadržavanje iste razine kontejnerskog prometa, čime se direktno utječe na uspješnost njihova poslovanja.

